ATNP/WG2

Working Paper -

ATNP Working Group 2

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ATN Systems Management Guidance material

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SUMMARY

This document is an updated version of the draft guidance material for Systems Management applied to CNS/ATM 1 Package compliant ATN Systems, produced by WG2-25 task.

This new version contains new recommendations for the selection and definition of Management information necessary to support Systems Management within Package 1 timeframe.

The group is invited to review and comment these recommendations

WG2-25

ATN Systems Management

Guidance Material

WG2-25/Draft

Version 0.3

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Revision History

30 Dec 1994: Draft.

07 Mar 1995: Added WG2 comments and new proposals

Foreword

This document is the output of the ATNP WG2 Systems Management Special Interest Group established at the San Diego meeting (October 1994). It sets up a global framework for Systems Management applied to CNS/ATM 1 Package compliant ATN Systems. It is recommended as *guidance material* only.

References

[1] ATN Manual version 2.0, dated 19 November 1993

ISO OSI NM REFERENCE STANDARDS

GENERALITIES

ISO 7498-4 Information processing systems - Open Systems Interconnection -fx Basic Reference Model - Part 4: Management Framework

ISO 10040 Information Technology - Open Systems Interconnection - Systems Management Overview

ISO 10040/PDAM 1 Information Technology - Open Systems Interconnection - Systems Management Overview - PDAM 1 : Management Knowledge Management Architecture

STRUCTURE OF MANAGEMENT INFORMATION

ISO 10165-1 Information Technology - Open Systems Interconnection - Structure of Management Information - Part 1: Management Information Model

ISO 10165-2 Information Technology - Open Systems Interconnection - Structure of Management Information - Part 2: Definition of Management Information

ISO 10165-4 Information Technology - Open Systems Interconnection - Structure of Management Information - Part 4: Guidelines for the Definition of Managed Objects

ISO 10165-5 Information Technology - Open Systems Interconnection - Structure of Management Information - Part 5: Generic Management Information

ISO 10165-7 General Relationship Model

SYSTEMS MANAGEMENT FUNCTIONS

ISO 10164-1 Information Technology - Open Systems Interconnection - Systems Management - Part 1: Object Management Function

ISO 10164-2 Information Technology - Open Systems Interconnection - Systems Management - Part 2: State Management Function

ISO 10164-3 Information Technology - Open Systems Interconnection - Systems Management - Part 3: Attributes for Representing Relationships

ISO 10164-4 Information Technology - Open Systems Interconnection - Systems Management - Part 4: Alarm Reporting Function

ISO 10164-5 Information Technology - Open Systems Interconnection - Systems Management - Part 5: Event Report Management Function

ISO 10164-6 Information Technology - Open Systems Interconnection - Systems Management - Part 6: Log Control Function

ISO 10164-7 Information Technology - Open Systems Interconnection - Systems Management - Part 7: Security Alarm Reporting Function (for CCITT applications)

ISO 10164-8 Information Technology - Open Systems Interconnection - Systems Management - Part 8: Security Audit Trail Function

ISO 10164-9 Information Technology - Open Systems Interconnection - Systems Management - Part 9: Objects and Attributes for Acces Control

ISO 10164-10 Information Technology - Open Systems Interconnection - Systems Management - Part 10: Accounting Meter Function

ISO 10164-11 Information Technology - Open Systems Interconnection - Systems Management - Part 11: Workload Monitoring Function

ISO 10164-12 Information Technology - Open Systems Interconnection - Systems Management - Part 12: Tests Management Function

ISO 10164-13 Information Technology - Open Systems Interconnection - Systems Management - Part 13: Summarization Function

ISO 10164-14 Information Technology - Open Systems Interconnection - Systems Management - Part 14: Confidence and Diagnostic Test Categories

ISO 10164-15 Information Technology - Open Systems Interconnection - Systems Management - Part 15: Scheduling Function

ISO 10164-X Management Domain Management Function

ISO 10164-X Management Knowledge Management Function

ISO 10164-X Enhanced Event Control Function

ISO 10164-X Time Management Function

ISO 10164-X Software Management Function

ISO 10164-X Change Over Function

ISO 10164-X Additional Selection Functionality for Discriminator Constructs

COMMUNICATIONS (CMIS/P)

ISO 9595 Information Technology - Open Systems Interconnection - Common Management Information Service Definition

ISO 9596-1 Information Technology - Open Systems Interconnection - Common Management Information Protocol Specification

MANAGED OBJECT SPECIFICATIONS

ISO 10733 Information Technology - Telecommunications and information exchange between systems - Elements of Management Information Relating to OSI Network Layer Standards

ISO 10737 Information Technology - Telecommunications and Information exchange between systems -Elements of Management Information Related to OSI Transport Layer Standards

ISO 10747 Information processing systems - Telecommunications and information exchange between systems - Protocol for exchange of inter-domain routeing information among intermediate systems to support forwarding of ISO 8473 PDUs (IDRP)

ADDITIONAL REFERENCES (FOR INFORMATION)

APPLICATION LAYER

ISO 9545 Information Technology - Open Systems Interconnection - Application Layer Structure

ISO 7498-1 Information processing systems - Open Systems Interconnection - Basic Reference Model - Part 1 : The Basic Model

ISO 7498-2 Information processing systems - Open Systems Interconnection - Basic Reference Model - Part 2 : Security Architecture

ISO 7498-3 Information processing systems - Open Systems Interconnection - Basic Reference Model - Part 3: Naming and addressing

FTAM

ISO 8571-2 Information processing systems - Open Systems Interconnection - File Transfer, Access and Management - Part 2: Virtual Filestore Definition

ASN.1

ISO 8824 Information Technology - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1)

ISO 8824-1 PDAM 2 Information Technology - Open Systems Interconnection - Abstract Syntax Notation One (ASN.1) - Part 1 : Specification of Basic Notation

ISO 8824-1 PDAM 3 Information Processing Systems - Open Systems Interconnection - Specification of Abstract Syntax notation One (ASN.1) - Part 1: Basic ASN.1 - Amendment 3: Rules of Extensibility

ISO 8824-2 Information Technology - Open Systesm Interconnection - Abstract Syntax Notation One (ASN.1) - Part 2: Information Object Specification

ISO 8824-3 Information Technology - Open Systesm Interconnection - Abstract Syntax Notation One (ASN.1) - Part 3: Constraint Specification

ISO 8824-4 Information Technology - Open Systesm Interconnection - Abstract Syntax Notation One (ASN.1) - Part 4: Parameterisation of ASN.1 Specifications

ISO 8825 Information Processing Systems - Open Systems Interconnection Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1)

ISO 8825-1/PDAM 2 Information Technology - Open Systems Interconnection - Specification of ASN.1 Encoding Rules - Part 1: Basic Encoding Rules (BER)

ISO 8825-2.2 Information Technology - Open Systems Interconnection - Specification of ASN.1 Encoding Rules - Part 2: Packed Encoding Rules (PER)

ISO 8825-3 Information Technology - Open Systems Interconnection - Specification of ASN.1 Encoding Rules - Part 3: Distinguished and Canonical Encoding Rules

1. Introduction

This document proposes some guidance material for the implementation of Systems Management solutions for ATN Systems within the timeframe of CNS/ATM 1 Package, with the objective of defining a framework for *interoperability* between the Systems involved in the management of ATN resources in order to enable the operation of the ATN internet.

Given the current lack of well identified operational requirements regarding Systems Management for the ATN internet , the definition and implementation of a global ATN Systems Management solution cannot be achieved within the timeframe foreseen for the package 1 SARP acceptance. Nevertheless, it is desirable that:

a) An ATN Management Information Model (i.e a set of Managed Objects) be defined for CNS/ATM package 1 in order to allow the support of local Management functions as well as the development of a future global ATN Systems Management solution.

b) The exchange of Systems Management information across administrative domain boundaries be possible as long as it does not compromise the safety and regularity of flight.

This document should be seen as a mean to identify common building blocks and especially to identify in a standardized fashion the minimum Management Information that should be handled by ATN Systems in order to allow the operation of the network. The Management information is defined, using the OSI Systems Management Information model and notations, as a set of Managed Objects (MOs) and related characteristics.

This document is not aimed at defining the Management Applications themselves. The set of proposed MOs is a selection derived from initial ATN experiments developed for ATM/CNS Package 1 validation but does not represent the complete set of MOs which can be handled within a domain . It should also be noted that these MOs definitions remain independant of how Mos should be implemented within a domain.

2. Assumptions regarding the exchange of Systems Management information across Management Domains

In the initial stages of the CNS/ATM 1 Package Systems deployement, we can reasonably assume that management domains will be constrained within administrative domain boundaries , ie each organization contributing to a component of the Package 1 ATN internet will be responsible for the management of its own domain.

The following requirements have been assumed for the exchange of Systems Management information :

1. No exchange of Systems Management information will be required between routers of different administrative domains .
2. No exchange of Systems Management information will be required by means of a management protocol over the air/ground links. This does not preclude the exchange of routing information, by means of routing information exchange protocols.
3. The exchange of Systems Management information within an administrative domain is considered a local matter and can be achieved by any means deemed appropriate.

3. Communications Framework

3.1. Inter Domain Management Communications

In order to ensure interoperability , OSI protocols should be used whenever exchange of management information takes place across management domain boundaries. This involves the use of CMIP, or FTAM where applicable, i.e. in any case a file exchange is required, for instance, to distribute configuration information, or to gather statistical data.

[Editor's note:
An implementation profile of these protocols has to be provided here.]

3.2. Intra Domain Management Communications

The exchange of management information within a management domain's boundaries is outside the scope of this document. However, it is expected that management protocols, such as CMIP and SNMP, will prevail, and that it will be possible to implement gateway functions to convert from one protocol to the other. Additionally, it may be necessary to use file transfer facilities such as FTAM or ftp.

3.3. Use of standardized Systems Management Functions

Recommendation 1 : *It is proposed that the 5 most stable standardized Systems management functions be retained for the ATN CNS/ATM package 1 Systems Management*
• *ISO 10164-1 Object Management function,*
• *ISO 10164-2 State Management function*
• *ISO 10164-4 Alarm Reporting Functio*
• *ISO 10164-5 Event Report Management Function, and*
• *ISO 10164-6 Log Control Function*

An advantage of such solution is that it would allow for instance to forward Alarms/Notifications to several Management systems in different Management domains in a standardized fashion. An ATN home domain responsible for the operation management of systems adjacent to an air/ground subnetwork would be able to receive notifications of events relating to this aircraft connectivity vis a vis the air/ground subnetwork.

3.4. Access control within OSI Systems Management interoperability framework

As this document adresses ATN Systems Management interoperability features , this section will be developed to describe how to ensure control of the access to Management Information within the ISO Systems Management communication framework. .

4. Management Information

4.1. Overview

This section is intended to provided guidance so as to help select the set of MOs and related properties that best fits the characteristics of the various categories of ATN Systems , in order to enable the operation of the initial network in the following areas :

- **Configuration Management**. In the case of the ATN, this includes aspects pertaining to routing initiation as well as to the configuration of communications resources.
- **Fault Management**, from the reception of problem messages issued by Systems, subnetworks, applications, or data, to problem resolution. This involves functions to automatically discover, isolate, and resolve network problems.
- **Performance Management.** The functions involved are those necessary to understand the level of service that is received from the ATN. This includes reporting as well as performance processing mechanisms.
- **Accounting management.** In ATN these functions should provide all information necessary to share the costs of ATN interconnection services between the various users.
- **Security Management.** Security management adresses the use of such facilities as access control and the detection and reporting of security violation . Definition of Management Information in this area will be limited to the information necessary to to ensure access control to Systems Management Information according to mechanism described in section **3.4** .

4.2. Common features

This section identifies those managed objects and related properties that are common to all ATN Systems, including ESs, ISs and ATN routers or BISs.

4.2.1. Generic MOs

Generic OSI definitions are provided by the following standards:

ISO 10165-2, and

ISO 10165-5.

Some of these definitions are used by other standards and are therefore an important foundation for the specification of an ATN Management Information Base.

In particular, depending on the set of SMFs supported, see section 4.1.3, the corresponding MOs will be selected from ISO 10165-2.

4.2.2. Network Layer Mos common to all systems

The MOs pertaining to the OSI Network Layer protocol and resources are defined in the following standards:

ISO 10733, ISO 10747, ISO 10589.

ISO 10747 related Mos may not be generic Mos , as it there may be implementation of ATN airborne Systems which does not contain IDRP. For these reasons IDRP Mos are listed in the section specific to ground routers.

Recommendation 2: *As the implementation of the ISO 10589 protocol is only recommended and not required, a recommendation for Mos selection would be to simplify ISO 10733 by removing requirements for Mos relating to 10589 protocol.*

One approach would be to consider the work already done in the ATN world, namely the contents of the ATN Manual chapter 12, as well as the specifications of the EURATN MIB

This would lead to the selection of the following Managed Objects -

networkSubsystem MO

This MO represents the container for the whole set of resources related to the Network Layer. There will be only one instance of this class. It is necessarily used as a superior by instances of other classes in the containment relationship.

networkEntity MO

This MO represents the access to the Network Services.

nSAP MO

This MO represents a set of local NSAP addresses known by a Network Service User (i.e. a Transport Entity). When there is only one of such user, all the NSAP addresses used in this context are held by one single instance of the *nSAP MO* class .

cLNS MO

This MO represents the operation of the ConnectionLess Network Protocol (ISO 8473)

This MO plays a role in routing initiation or Systems Management initialization . If the Systems is a ground router adjacent to an air/ground subnetwork , a particular notification is sent to the manager so as to inform it that an aircraft is now reachable .

linkage MO

This MO as defined in the standard ISO/IEC 10733 offer several packages. One of this package represent the operation of the ES-IS protocol (ISO 9542) ; Another package concerns the use of connection oriented SNDCF .

4.2.3. MOs for the support of Systems Management Functions

To be defined according to the set of supported SMFs.

If recommendation 1 is accepted , the following standard Mos are necessary for the use of these SMFs :

system MO

In the Management Information Tree, this MO is taken as the container for the set of managed objects related to the communication protocols. Basically, this instance can be regarded as the root in the agent's containment tree.

Typically, a system MO will exist for each ES and BIS of the managed ATN network :

Recommendation 3 : *an additional non-standard attribute can be added to the system MO to indicates the type of ATN system.*

alarmRecord MO

This managed object class is derived from the event log record object class, which is defined in ISO/IEC 10165-2.

It represents information stored in logs as a result of receiving notifications

attributeValueChangeRecord MO

This managed object class is derived from the event log record object class, which is described in ISO/IEC 10165-2.

It represents information stored in logs as a result of receiving notifications, the type of which is *attributeValueChange*.

communicationsInformationRecord MO

This managed object class is derived from the event log record object class, which is described in ISO/IEC 10165-2.

It represents information stored in logs as a result of receiving notifications, the type of which is *communicationsInformation*. This MO is defined in ISO/IEC 10165-5

eventForwardingDiscriminator MO

The *Discriminator MO* is a superclass for the *Event Forwarding Discriminator MO* ; it provides for specification of common conditions that shall be satisfied prior to sending a notification.

The *EventForwardingDiscriminator MO* enables to control the sending of notifications in relation to a particular manager. This MO can be created, modified and deleted by the manager. Moreover, tests on the following attributes may be specified by its *discriminatorConstruct* attribute :

managed object class,
managed object instance,
event type,
event type specific attributes (severity, ...).

log MO

The log managed object class is used to define the criteria for controlling the logging of information in the ATN Agent.

New log records will only be created if the discriminator input object satisfies the conditions specified in the *discriminatorConstruct* attribute of the log and if the log is in the unlocked administrative state, and is not in the disabled operational state, and has neither the log-full (for a log that halts), nor the off-duty availability status.

objectCreationRecord MO

This managed object class is derived from the event log record object class, which is described in ISO/IEC 10165-2.

It represents information stored in logs resulting from object creation notifications.

objectDeletionRecord MO

This managed object class is derived from the event log record object class, which is described in ISO/IEC 10165-2.

It represents information stored in logs resulting from object deletion notifications.

stateChangeRecord MO

This managed object class is derived from the event log record object class, which is described in ISO/IEC 10165-2.

It represents information stored in logs resulting from state change notifications.

4.2.4. Others Mos common to all Systems

To be defined.

4.3. ATN Routers

The definition of Management Information base must be differentiated according to the type of ATN BIS , as airborne router, air/ground router, ground/ground router have to satisfy different Systems Management requirements.

In addition to the common features, ATN routers may encompass the following managed objects and related properties.

4.3.1. Ground-based Routers

A mandatory feature of ground-based ATN routers is the support of IDRP. Correspondingly, it is expected that the management of these routers be based on the IDRP-related management information, which includes:

idrpConfig MO

This MO represents the configuration and operation of the IDRP protocol (ISO 10747).

adjacentBIS MO

In the operation of the IDRP protocol, an instance of this managed object class is created when a neighbor BIS is accessible via a single subnetwork, and therefore a further connection is possible between this BIS and the local BIS.

4.3.2. Air-Ground BIS (ground system)

In addition to Common Management Information defined for the ground systems, the air-ground BIS should also provide information relating to routing capabilities and subnetwork connectivity. This will lead to the definition of

- Mobile SNDCF Mos
- Refinement of the CLNP linkage Mo. This Mo as defined in ISO-10733 contains two packages, one related to the operation of 9542 and one related to the use a connection oriented subnetwork (SNDCF package)

Recommendation 4 :

For the ATN the definition of the SNDCF package of the linkage MO needs to be widened to include more information relating to the SNDCF . This recommendation is to organize this SNDCF information in a separate MO , and simplify the definition of the linkage MO in order to represent only the operation of 9542.

In line with this recommendation, the following non standard MOs could be of interest for the mobile SNDCFs

sNType MO

Recommendation 5: *definition of the sNType MO*

This class is used to describe each type of subnetwork available in the ATN system , for instance satellite , Mode-S , independently of the means by which the subnetwork service is provided.

subnetwork MO

Recommendation 6 : *use of the subnetwork MO*

This class is used to describe the QoS parameters of a subnetwork available in the ATN system, as well as the address required for establishing SN-connections and the service provider identification.

sNDCF MO

Recommendation 7*: definition of the sNDCF MO*

The sNDCF MO describes the use of the subnetwork (operational, non operational) ; there will be one instance of this class created for each subnetwork available in the ATN system.

For each instance of the *subnetwork MO* class, there will be a peer instance of the *sNDCF MO* class.

sNConnectionContext MO

Recommendation 8 : *definition of the sNConnectionContext MO*

This MO is implemented in the SNDCF and it represents information related to a group of subnetwork (SN) connections established between the local system and the same SNPA destination by use of SN services offered by a single service provider.
Basically, this MO relates to the notion of *virtual circuit* used by X.25.

This means that one such instance will be automatically created whenever a connection is initiated or accepted by the local system, towards a new SNPA pair, using a new subnetwork.

Since the connections between ground systems will not be dynamic, the instances of this MO class will reflect the "moving" connections between aircrafts and ground systems.

4.3.3. Airborne BIS

One of the major assumptions for CNS/ATM 1 Package is that there will be no exchange of management information over the air-ground links. As a consequence, there is no strict requirement as to support MOs for airborne systems. However, it is expected that the management of ATN resources will be handled by dedicated onboard management mechanisms. These may include the support of MOs similar to those supported by ground systems, and, where it is the case, management communications with the ground will be permitted. In this case, the constraints applied to inter-domain management communications will apply.

4.4. ATN End Systems

4.4.1. Ground-based ES

In order to manage the operation of ATN ESs, it is recommended that all ground ESs implement the set of MOs defined for representing OSI Transport Layer protocols and resources, as specified in ISO 10737.

Transport Mos counters will be essential for the determination of the Quality of service of the ATN internet.

Recommendation 9 : *as suggested in the ATN defect report 43, the definition of the transport connection MO can be widened to include two additional attributes, the current receive and current transmit windows .*

4.4.2. Airborne ES

Same remark as for airborne routers.

5. Naming of ATN Managed Objects and registration

The identification of an object consists of :

- the identification of its object class in the registration tree which is an ASN.1 Object Identifier;

- the identification of the object instance in the containment tree, which is a Distinguished Name (DN).

Moreover, each individual attribute of an object is identified by an ASN.1 Object Identifier.

Naming standardization is necessary for the interoperability of Management Systems. All objects subject to ISO standardization have been registered in an ISO registration tree , but conventions need to be established for the naming or registration of specific ATN MOs or for a standard MO to which attribute(s) are added for ATN purpose.

(In general, in order to avoid the renaming of a standard Managed Object , it is advised to organize the additional information in a subclass, using inheritance properties) .